SIMPLIFIED LESSON ON PROPER CARE OF AUTOS

Times-Dispatch Auto Expert Explains Magneto Wiring and the Alternating Current.

HOW TO MAKE CURRENT DIRECT

Dirt or Oil on Commutator Will Cause Short-Circuiting of the Segments—Cleaning With Gasoline Is the Remedy.

LESSON NO. 36.
The Magneto.

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In the first lesson on the magneto you were shown how, when a wire is made to cut through the magnetic field of a magnet, a current of electricity is generated in the wire. On this principle is based the design of all electrical generators.

You were also told that as the wire cuts through the magnetic field in one direction, say upward, the current will flow in one direction in the wire, while, when it cuts in the opposite direction, the current will flow in the opposite direction. Thus, in Fig. 1, the wire A will be cutting upward during one-half the revolution, and so the current will travel out of C, while during the next half-revolution A (now in the position of B) will be cutting downward, and so the current will flow in at C. When the direction of flow of the current alternates as above we say that it is an alternating current.

Now, the purpose of the generator is to charge a storage battery, but a storage battery cannot be charged with an alternating current, so a machine as above will not do. Then what can be done to make the current "direct"? If each end of the wire were fastened to a half-ring, as shown in Fig. 2, the brush D, as the wire and half-rings revolve, would always be rubbing against the half-ring attached to the wire cutting upward, and the brush E to the half-ring attached to the wire cutting downward. Thus the current would always flow out (say) from the Brush D and in at the brush E, and so the current in the wire F would be of direct current, or always flowing in one direction.

The half-rings to which the ends of the wire are attached would have to be separated by some insulating material, so as to prevent the brushes catching; to give strength; and to prevent dirt, oil, etc., getting between them and causing a short circuit. As you will see later, these half-rings are reduced to small segments of circles in practice.

Of course, one loop of wire as shown in Fig. 2, will not give sufficient and a steady enough voltage to be practical, and so a number of loops arranged in a circle, as shown in Fig. 3, are used. Instead of attaching the ends of the loops to a large semicircular segment, as in Fig. 2, a number of small segments are used. Sometimes each loop has its own segment, but more often a few of the adjacent loops are attached to one segment.

For mechanical reasons, and also to intensify the current generated, the loops of wire are wound on a soft iron core. This core is made up of a large number of discs, or is laminated. The core with the loops or winding is called the armature. Figure 4 shows a complete armature with the commutator at the right.

So much for the armature. Now as to the magnets. You have had brought to your attention two kinds of magnets; namely, the permanent magnet, made of hard steel, and the electro-magnet, made of soft iron, with a coil of wire wound about it, which is a magnet only when current is flowing through the wire. The latter type of magnet is used in practically all the generators used in the starting and lighting systems of to-day.

From where can we get the current which must flow through the wire wound on this core? Why, from the armature, as shown in Fig. 6. Here a wire is connected to one of the brushes, then wrapped about one core, then the other and then returns to the second brush, while separate wires go out of the machine to the battery, lights, etc. When a portion of the current is so shunted from the main line, we say that the generator is shunt wound. The coil of wire around the magnets is called the field coil, as the magnetic field is due to it.

In stationary dynamos (or generators) as are used in large power plants and in some of the small generators used on the automobile, in addition to the shunt winding as explained above, the main current, before leaving the machine, is first made to flow through a few turns of wire placed on the field magnets, the field coil thus being in "series" with the outside units. Where the field coil has two windings, one a shunt and the other a series, it is said to be compound wound.

Perhaps a question has come to you, namely, if the current generated by the armature is due to the armature windings cutting through the magnetic field and if the core is a magnet only when current is flowing through its coil, then, when the machine has stopped, there will be no magnetic field, as no current will be flowing through the field coils, and so when the armature is started revolving there will be no field and so no current will be generated. This problem is taken care of by having the material of which the core is made, such that once it is magnetized it will always retain a small amount of magnetism, called residual magnetism. This will yield a slight current at starting, and then this current, by flowing through the field coils will increase the magnetism, this magnetism thus being built up until the maximum, for that speed of armature revolution, is reached.

In some generators instead of there being only two magnets with their coils, there are four, six, eight, etc., placed equal distances apart, in a circle, the first being a positive pole, the second negative, next positive, next negative and so on.

As to the collector brushes which, by rubbing against the commutator, collect the current generated by the armature? These, while some times made of copper, are most always made of prepared carbon. In order to allow for wear, they are mounted in a pivoted arm or in such a way that they can slide back and forth, and are held against the commutator by means of springs.

The generator armature and field coils will practically never give trouble, but the commutator and brushes will sometimes be the cause of the generator giving but little or an irregular current. In time the brushes will wear out and will have to be replaced. Sometimes the brush springs become broken or weak, and so do not hold the brushes against the commutator properly.

Sometimes grit will get in the bottom of a brush and so cause a scratching of the commutator and sparking, and, because of this sparking, the commutator will be burned away, the result being that all of the current generated will not be collected.

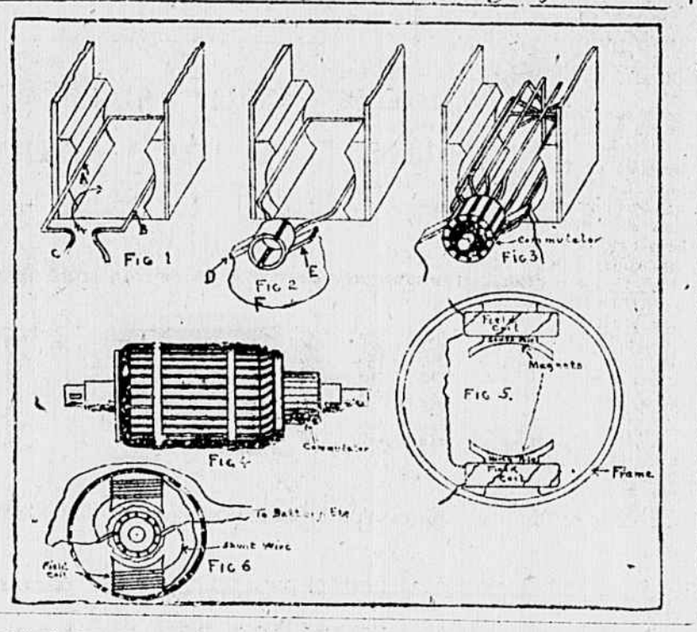
The insulation placed between the segments of the commutator is usually mica, and sometimes this will not wear as fast as the commutator segments, with the result that it will protrude, and so make the brushes bounce, the brushes thus being in contact with the commutator only part of the time. Where this is the case, or when the commutator has become rough, the generator should be sent to the factory or service station, so that the commutator can be turned down and smoothed.

Almost all of the trouble mentioned above will be indicated by a sparking at the brushes and often by flickering lights.

Dirt or oil, etc., on the commutator will cause a short-circuiting of the segments. Cleaning with a cloth moistened with gasoline is the remedy.

The generator of to-day is so perfect, and such precautions have been taken to avoid the above troubles, that it seldom is the cause of trouble. Failure of the battery being charged seldom being due to a fault in the generator, but rather to a loose or short-circuited wire.

Diagram of Magneto Wiring System



QUESTIONS AND ANSWERS

If you have any problems or wish any information about your automobile, write the Auto Editor, The Times-Dispatch, giving the make of your car, your name and address, and answers will appear under this heading.

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Q. The paint on my car has become very dull. Is there any way to make this brighter? Also, after washing, the car is always spotted in appearance, even though I play the hose on it for some time. Why is this? K. L. S.

A. There are a number of furniture and piano polishes on the market which will make the varnish appear a little brighter immediately after being used. Some, by acting on the varnish, will do more harm than good, however. If, after you have finished playing the hose on the car, you rub it with a soft chamois, rinsing the chamois in clear water periodically, the spots you mention will not appear.

Q. What volt lamps is it best to use on a Ford car, and what amperage? T. H. K.

A. A 9-volt and about 12-candle-power bulb is an excellent one for Ford cars. Bulbs are not sold according to the amperage, but by voltage, candle power and style of socket. When buying bulbs you must know the style of socket and whether used with a single or double contact.

Q. I have a 1917 (——) car. Of late when turning corners the car will jerk, and unless I shift to second it will stall. What is wrong? A. T. L.

A. Your valve probably needs to be ground. You would do well to shift to second before making the turn, as by doing so you will have a better control of the car.

Q. What is the right thing to do when the casing or shoe of the tire has been badly cut, but not deep enough to harm the canvas part? J. J. McA.

A. If the cut is not so large that it can be filled with tire dough, mastic or some similar tire-cut filler, it should be so filled. If it is a deep gash, in which the filler can not be held, then it would be best to take the tire to some repair establishment and have it vulcanized. Failure to fill, even the smallest cut, will result in the rubber parting from the fabric.

Q. The tail light of my 1916 (——) car has recently been troubling me by going out and then lighting up again. The jouncing of the car seems to make it go out or light. I have carefully looked for a loose wire, and also have put in a new bulb, but it does not help any. Can you suggest what could be the cause of this? H. H. O.

A. The trouble is probably in the socket for the bulb. The spring which presses out the contact pieces may be weak or broken. Dirt or rust may have got between the side of the socket and bulb, and so interfere with the return of the current to the "ground." return of the current to the

Q. My car overheats a lot of late. I have had the carbon removed, and know that my spark is not too late. Also the water circulates very freely and is quite clean. Is there anything else I should look to? E. H. F.

A. Perhaps your fan belt is slipping. Try tightening it, and if it is of leather smear a little castor oil on it.

Q. The oil which I use in the differential gets on to my brake very often. I have put on a new felt, but it does not help. In relining the brake, would it be advisable to use a thicker lining? I believe I could make a better job with a heavier lining, as I could countersink deeper without the lining tearing on me. I have a 1911 (——) car.

A. It is possible that the dowel pin, which holds the sleeve of the roller bearing from revolving, has come out, and that the oil is working out through this hole. By drawing the wheel you will be able to see this. The oil may be working through the sides of this pin if it has not come out entirely. I believe you would do better if you used a grease instead of an oil. If you can get the wheel, one with a heavier lining on the brake bands, there is no reason why you should not use it. It is often to one, however, that even a sixteenth of an inch heavier lining will be enough to prevent the wheel going on without binding badly.